IUE Low Dispersion Sensitivity Monitoring XIV.

Introduction

The low dispersion sensitivity monitoring analysis for the three active cameras has been updated to June 1988. The LWR data base has been expanded to include -4.5 kV UVC data after it was found to be compatible with the -5.0 kV data (Sonneborn and Garhart, 1987a). Camera sensitivity is monitored through the use of five standard stars:

BD+28° 4211, HD 93521, HD60753, BD+33° 2642, BD+75° 325.

The symbols for each star are, respectively:

$+ , * , \diamond , \square , \triangle .$

The sensitivity data are analyzed using the standard methods as described by Holm and Schiffer (1980). The data are ratioed to a reference spectrum for each star and placed into three wavelength bins, each 150Å wide (300Å for the LWR). The binned flux ratios are then fit with a multiple linear regression to find the time dependent coefficient (%/yr.) for each wavelength region and the overall temperature dependent coefficient (%/°C) of the camera. The temperature dependence is fit to the head amplifier temperature (THDA) and is assumed to be time independent. The LWP camera uses six wavelength bins and the flux, instead of being ratioed to a reference spectrum, is normalized to the maximum flux. The SWP sensitivity monitoring does not include the fifth standard BD+75° 325 in its analysis.

Analysis

The temperature and time dependent coefficients for the three cameras are listed in Table 1. The data are normalized to 1978 for the LWR and SWP, and 1980 for the LWP, and corrected for camera temperature (THDA) dependence before being plotted in Figures 1-4.

The results of the LWP data are plotted in Figures 1 and 2. The 2150Å and the 2900Å wavelengths still show an essentially zero sensitivity degradation. The time dependent coefficients are significantly lower when compared with both the early data (ie. from 1983 and 1984) and the data from the other cameras. There also appears to be a reversal in the sensitivity degradation of the camera toward the longer wavelength regions.

The LWR sensitivity degradation rate (Figure 3), with the inclusion of the -4.5 kV UVC data is lower than in previous years. Figure 5 has been included as a comparison of the -4.5 kV to -5.0 kV UVC data and, as predicted, shows a good match between the two sets of data.

The SWP data, as plotted in Figure 4, exhibit little change over previous values. The central wavelength region, although more sensitive than the other two regions, shows a

greater decrease in camera sensitivity.

The camera head amplifier temperatures (THDA) are monitored to check for any temporal variations and are plotted in Figure 6. The average THDA values for the three cameras are:

LWP (1988.1) = 9.7 °C
LWR (1988.1) = 14.6 °C
SWP (1988.1) = 9.7 °C

Excluding the THDA data from approximately 1981 and earlier, there appears to be no significant increase in camera temperatures.

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Terry J. Teays

17 June 1988

Holm, A.V., and Schiffer, F.H., 1980. "IUE Camera Sensitivity Variations", NASA IUE Newsletter No.9, p.8.

Sonneborn, G., and Garhart, M.P., 1986. "Low Dispersion Quick-Look Sensitivity Monitoring XI.", NASA IUE Newsletter No.31, p.29

Sonneborn, G., and Garhart, M.P., 1987a. "A Comparison of LWR Sensitivity Monitoring at UVC Settings of 4.5 and 5.0 kV", NASA IUE Newsletter No.33, p.75

Sonneborn, G., and Garhart, M.P., 1987b. "IUE Low Dispersion Sensitivity Monitoring XII.", NASA IUE Newsletter No.33, p.78

Table 1.

Results of low dispersion camera sensitivity analysis - June 1988

LWP Camera

Temperature dependence = -0.24 ± 0.02 %/°C
RMS error for a single observation = 3.5 %
315 data points used in regression

Wavelength Region (Å)	Time Dependence (%/yr.) 1980.4 through 1988.4	1987.7	1986.4	1985.3	1984.2	1983.4
2075 - 2225	-0.05±0.04	+0.07±0.05	+0.20±0.09	+0.29±0.11	-0.09±0.15	-0.14±0.21
2225 - 2375	-0.33±0.04	-0.27±0.05	-0.22±0.09	-0.06±0.11	-0.61±0.15	-0.91±0.21
2375 - 2525	-0.42±0.04	-0.40±0.05	-0.42±0.09	-0.27±0.11	-1.05±0.15	-1.42±0.21
2525 - 2675	-0.55±0.04	-0.59±0.05	-0.48±0.09	-0.13±0.11	-0.84±0.15	-1.12±0.21
2675 - 2825	-0.27±0.04	-0.34±0.05	-0.11±0.09	+0.24±0.11	-0.03±0.15	-0.13±0.21
2825 - 2975	+0.03±0.04	-0.05±0.05	+0.11±0.09	+0.39±0.11	+0.15±0.15	+0.07±0.21

LWR Camera

Temperature dependence = -0.82 ± 0.04 %/°C
RMS error for a single observation = 3.5 %
371 data points used in regression
-5.0 kV UVC = 319 data pts.
-4.5 kV UVC = 52 data pts.

Wavelength Region (Å)	Time dependence (%/yr.) 1978.2 through 1988.1	1987.7	1986.4	1985.3	1984.2	1983.4
2250 - 2550	-2.06±0.04	-2.34±0.05	-2.49±0.08	-2.23±0.10	-2.45±0.09	-2.30±0.11
2550 - 2650	-1.51±0.04	-1.65±0.05	-1.73±0.08	-1.69±0.10	-1.36±0.09	-1.19±0.11
2750 - 3050	-1.34±0.04	-1.55±0.05	-1.73±0.08	-1.84±0.10	-1.35±0.09	-1.13±0.11

SWP Camera

Temperature dependence = -0.44 ± 0.04 %/°C
RMS error for a single observation = 3.2 %
322 data points used in regression

Wavelength Region (Å)	Time dependence (%/yr.) 1979.5 through 1988.4	1987.7	1986.3	1985.3	1984.2	1983.4
1225 - 1375	-0.72±0.04	-0.69±0.04	-0.66±0.06	-0.69±0.08	-0.72±0.13	-0.46±0.16
1475 - 1625	-0.44±0.04	-0.38±0.04	-0.22±0.06	-0.17±0.08	-0.16±0.13	+0.16±0.16
1775 - 1925	-0.78±0.04	-0.78±0.04	-0.69±0.06	-0.63±0.08	-0.86±0.13	-0.63±0.16

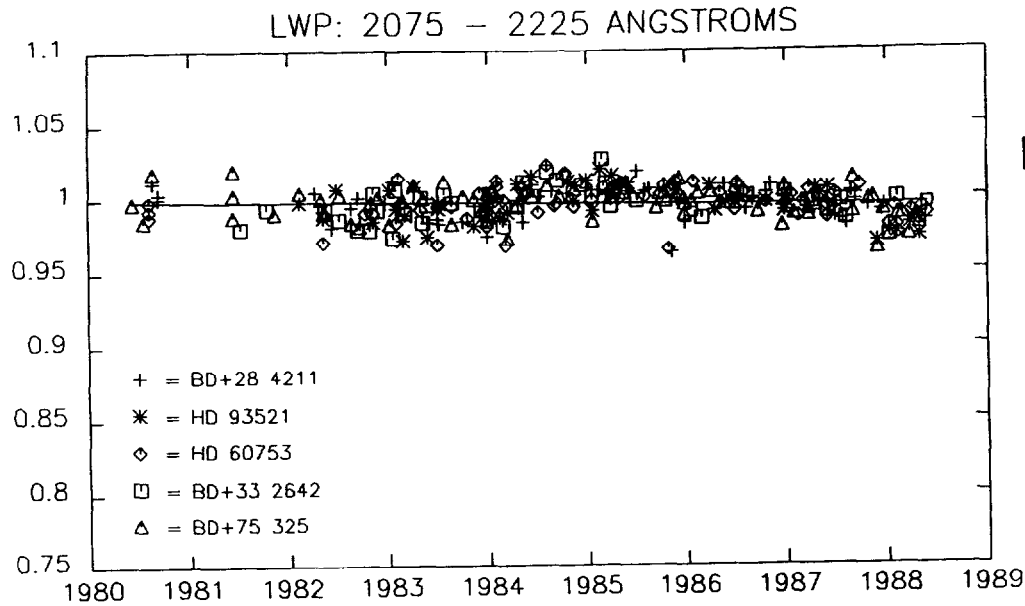
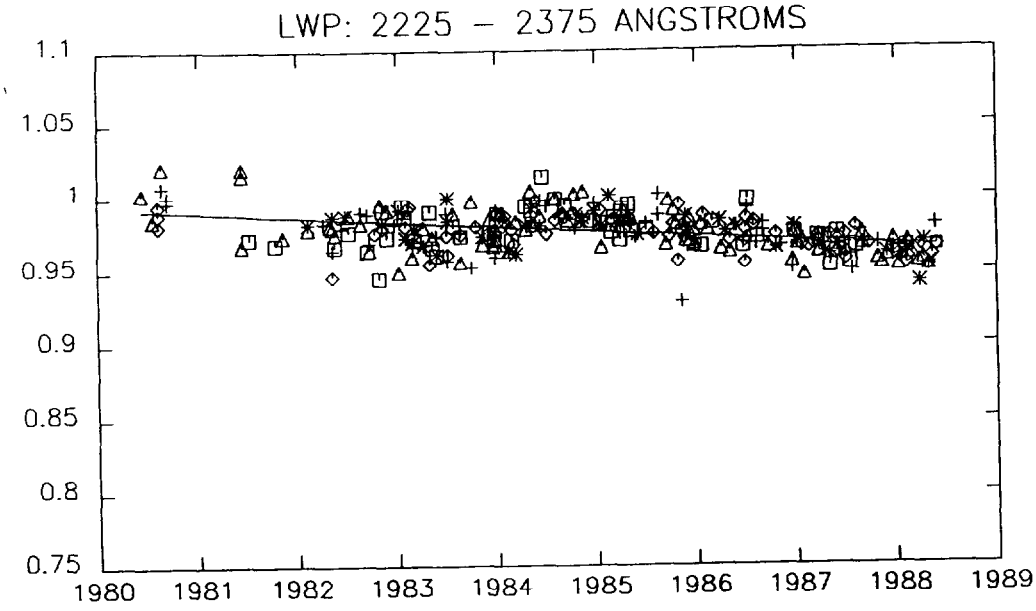

LWP: 2075 – 2225 ANGSTROMS
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
+ = BD+28 4211
* = HD 93521
◇ = HD 60753
□ = BD+33 2642
△ = BD+75 325
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989

Figure 1.


LWP: 2225 – 2375 ANGSTROMS
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1
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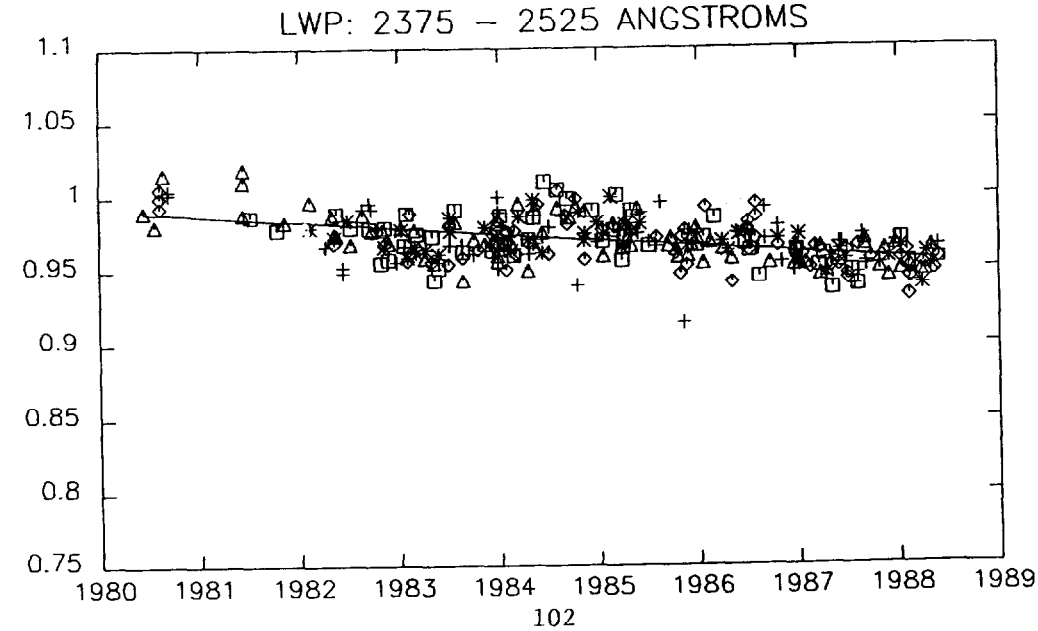
0.9
0.85
0.8
0.75
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989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1
0.95
0.9
0.85
0.8
0.75
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989

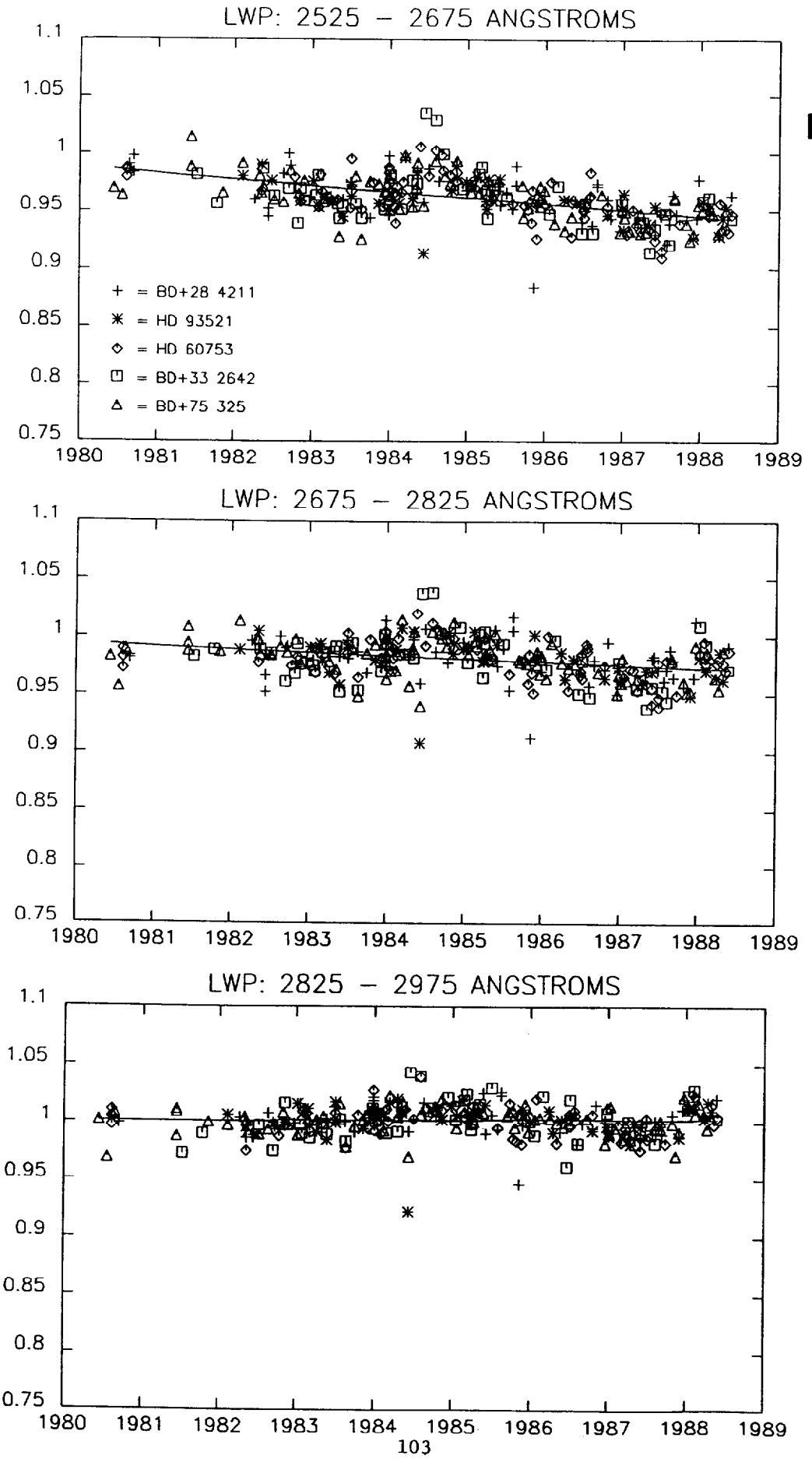
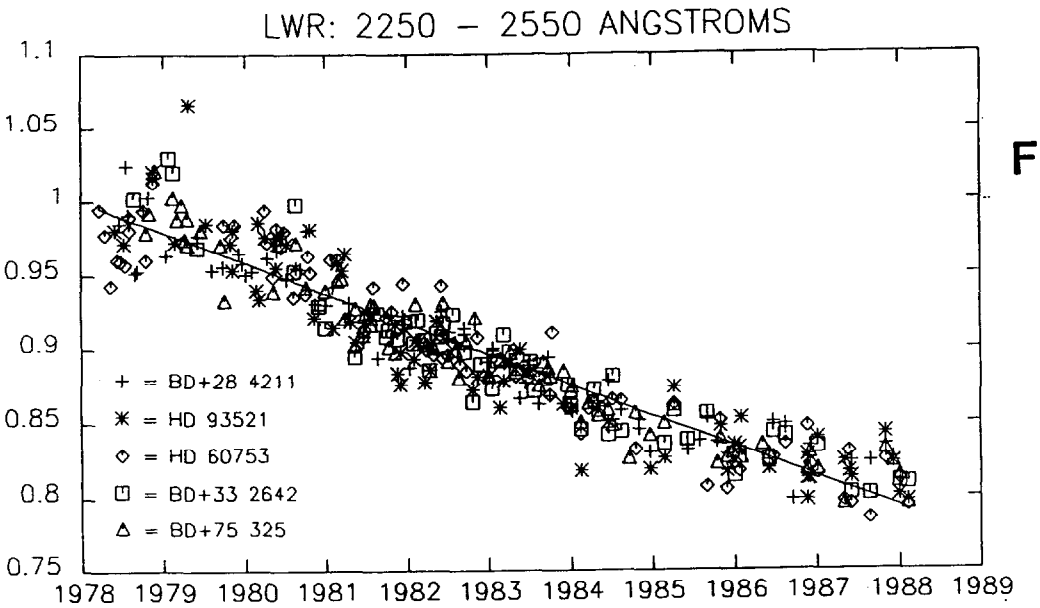
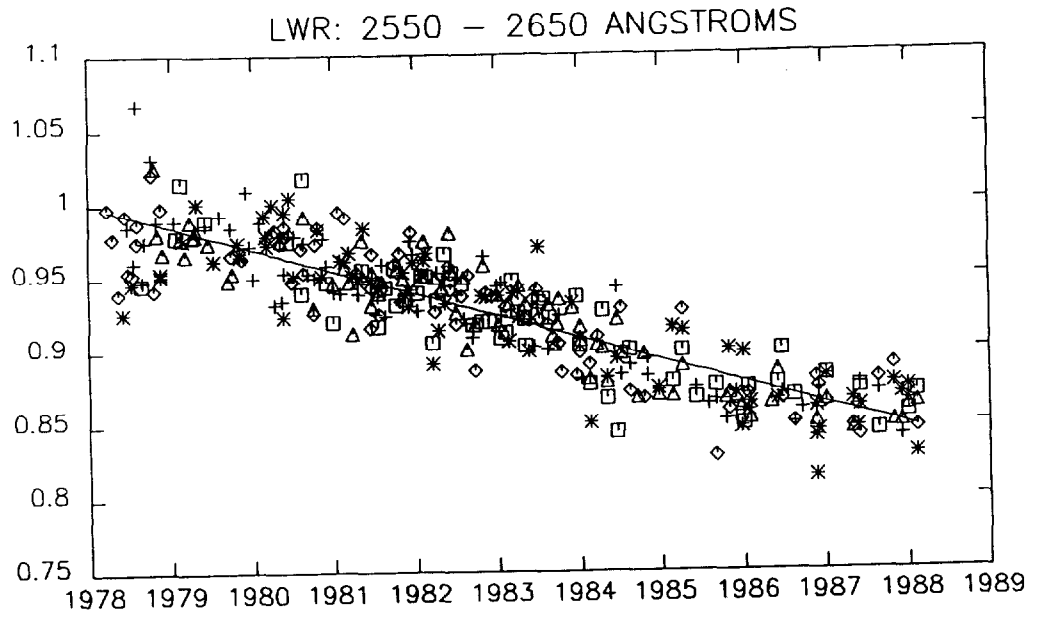

LWP: 2525 – 2675 ANGSTROMS
LWP: 2675 – 2825 ANGSTROMS
LWP: 2825 – 2975 ANGSTROMS
+ = BD+28 4211
* = HD 93521
◇ = HD 60753
□ = BD+33 2642
△ = BD+75 325
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989

Figure 2.


LWR: 2250 – 2550 ANGSTROMS
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
+ = BD+28 4211
* = HD 93521
◇ = HD 60753
□ = BD+33 2642
△ = BD+75 325
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989


LWR: 2550 – 2650 ANGSTROMS
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1.05
1
0.95
0.9
0.85
0.8
0.75
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989

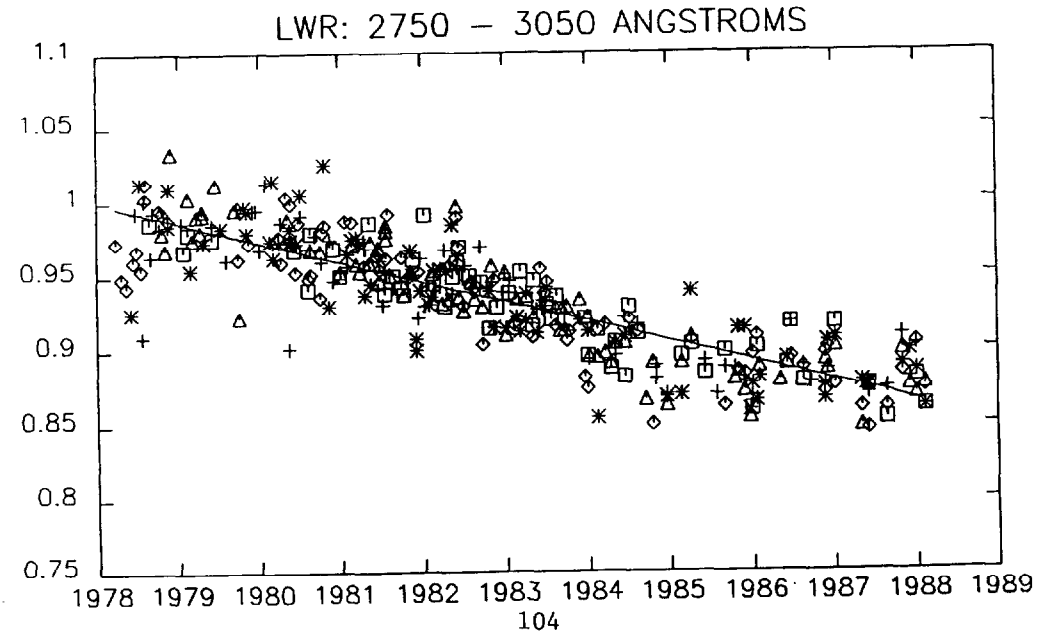
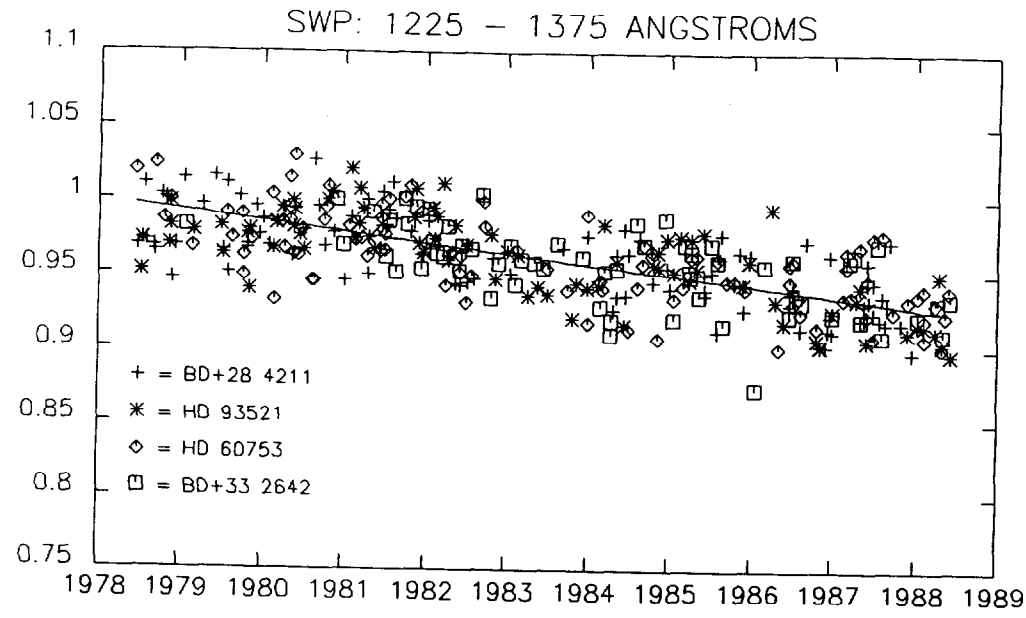
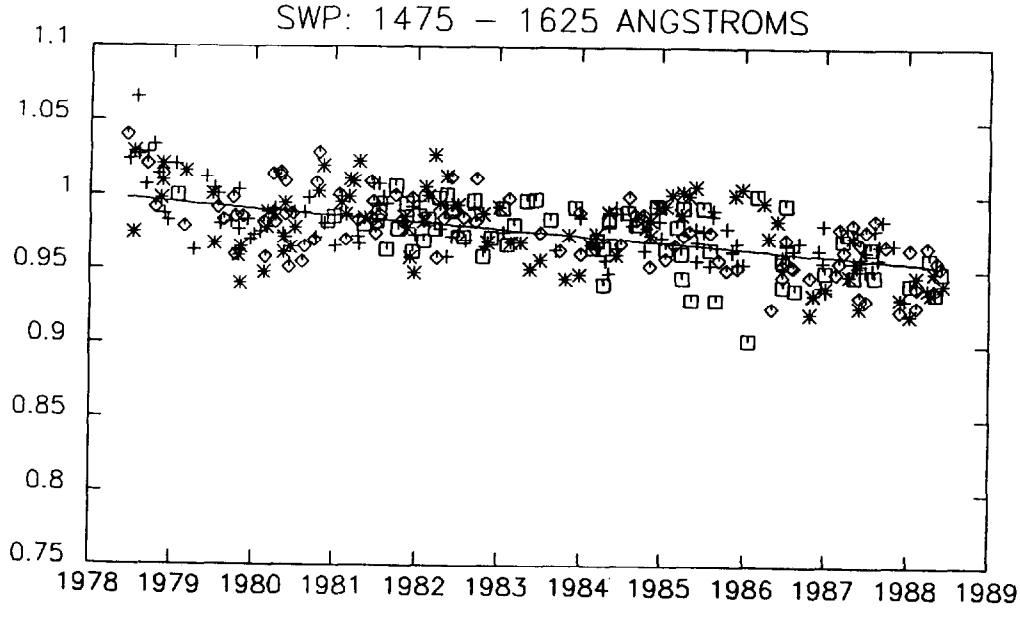

LWR: 2750 – 3050 ANGSTROMS
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989

Figure 3.


SWP: 1225 – 1375 ANGSTROMS
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
+ = BD+28 4211
* = HD 93521
◇ = HD 60753
□ = BD+33 2642
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989


SWP: 1475 – 1625 ANGSTROMS
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1.05
1
0.95
0.9
0.85
0.8
0.75
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989

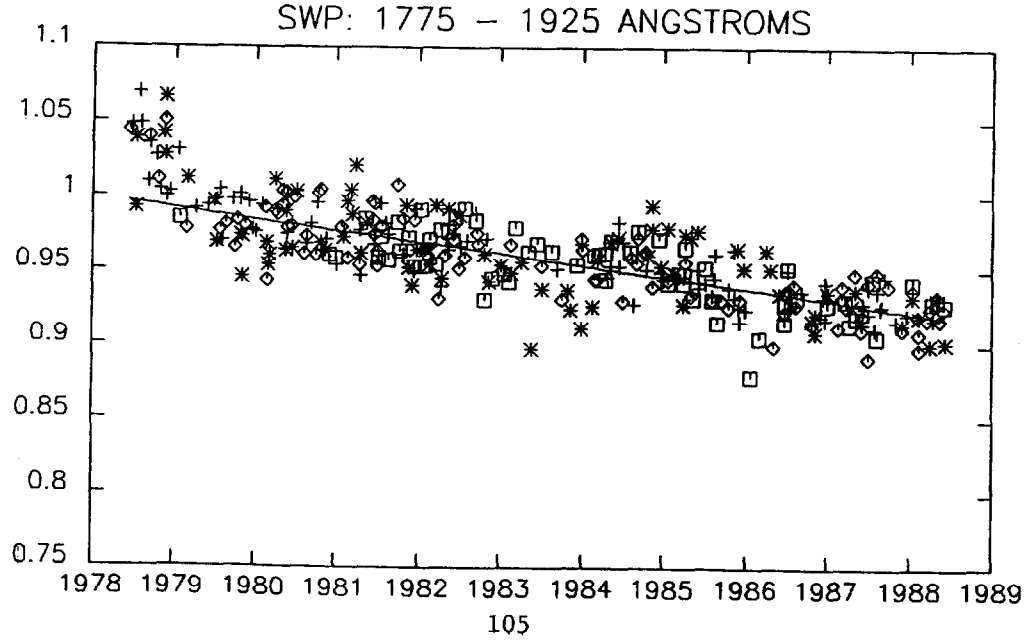
SWP: 1775 – 1925 ANGSTROMS
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989

Figure 4.

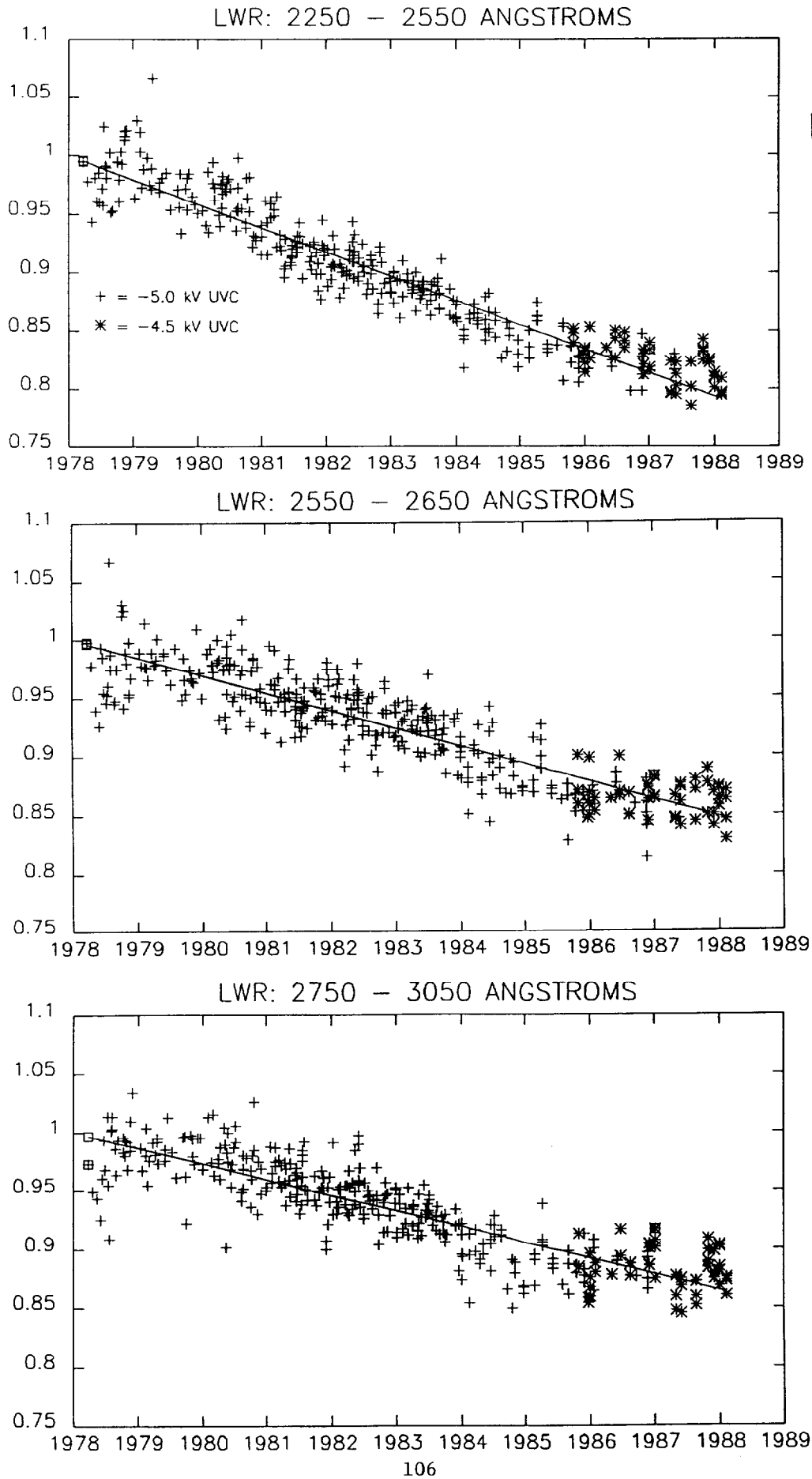
LWR: 2250 – 2550 ANGSTROMS
+ = −5.0 kV UVC
* = −4.5 kV UVC
LWR: 2550 – 2650 ANGSTROMS
LWR: 2750 – 3050 ANGSTROMS
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989

Figure 5.

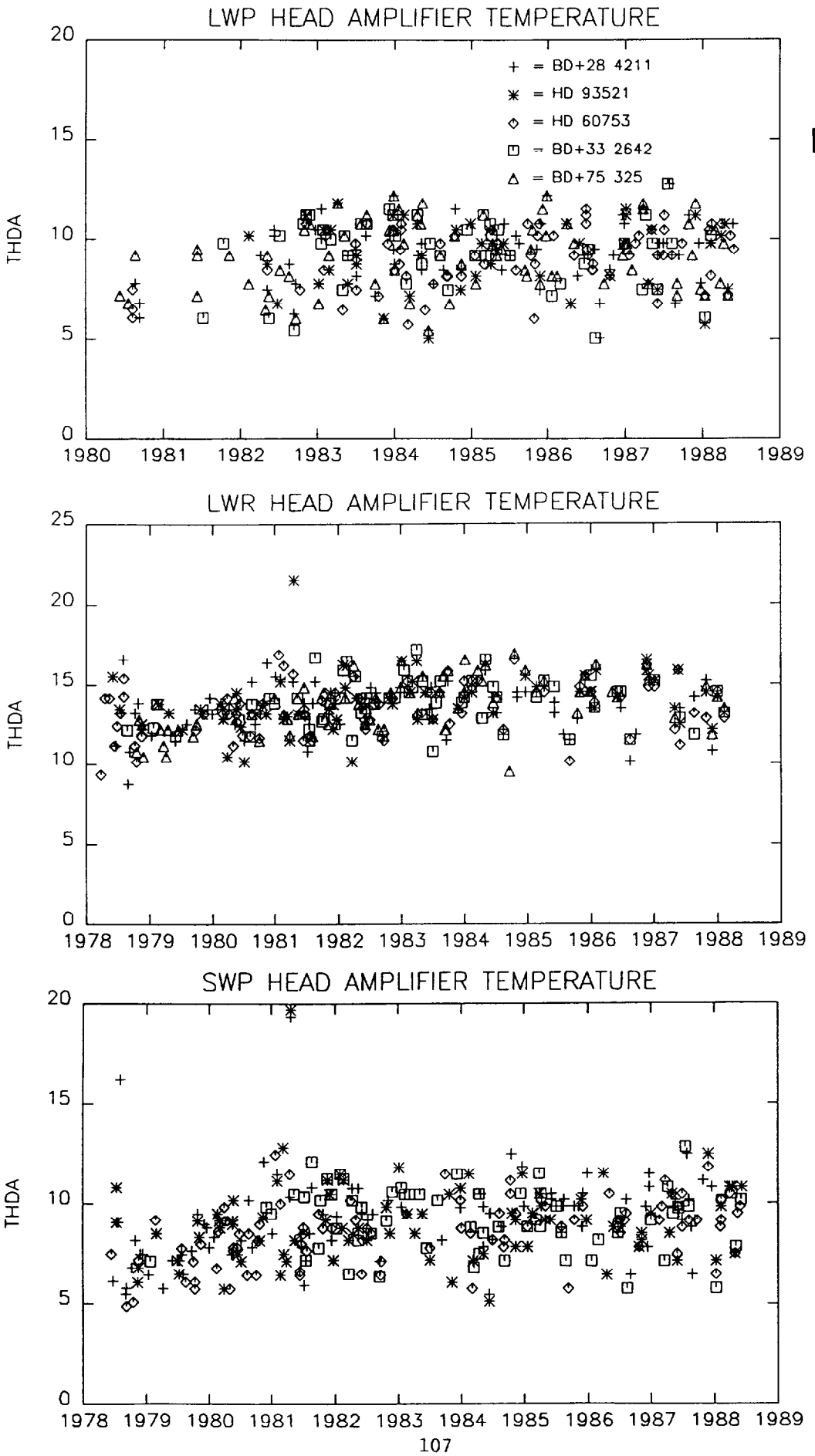
LWP HEAD AMPLIFIER TEMPERATURE
+ = BD+28 4211
* = HD 93521
◇ = HD 60753
□ = BD+33 2642
△ = BD+75 325
THDA
0
5
10
15
20
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989
LWR HEAD AMPLIFIER TEMPERATURE
THDA
0
5
10
15
20
25
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989
SWP HEAD AMPLIFIER TEMPERATURE
THDA
0
5
10
15
20
1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989

Figure 6.